

Docket No. 87305.0024
Customer No. 30734

PATENT



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES
APPEAL BRIEF FOR THE APPELLANTS

Ex parte Steinhardt et al.

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Applicant: Steinhardt et al.

Serial No. 09/625,200

Art Unit: 1763

Filed: July 21, 2000

Examiner: P. Hassanzadeh

For: DEVICE TO GENERATE EXCITED/IONIZED PARTICLES IN A PLASMA

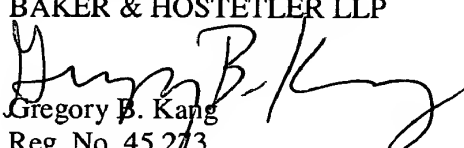
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P.O. Box 1450
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Sir:

Submitted herewith are three copies (3) of an Appeal Brief and a check for the official fee for the Appeal Brief, in the amount of Three Hundred and Twenty Dollars (\$320.00). A Notice of Appeal was filed on May 8, 2003. A petition for a one month extension of time along with the requisite fee is submitted herewith extending the time for response to August 8, 2003. In the event the Appeal Brief is not timely filed, appellants petition for an appropriate extension of time. Please charge any fee deficiencies or credit any overpayments to Deposit Account No. 50-2036.

Respectfully submitted,

BAKER & HOSTETLER LLP


Gregory B. Kang
Reg. No. 45,273

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320.00 DP -

Date: August 8, 2003
Washington Square, Suite 1100
1050 Connecticut Avenue, N.W.
Washington, D.C. 20036
Phone: (202) 861-1500
Fax: (202) 861-1783

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BRIEF ON APPEAL

I. INTRODUCTION

This is an appeal from the final Office Action dated November 8, 2002. A Notice of Appeal was filed on May 8, 2003. A petition for a one month extension of time along with the requisite fee is submitted herewith extending the time for response to August 8, 2003.

II. REAL PARTY IN INTEREST

The Real Party in Interest in the present application is R3T Rapid Reactive Radicals Technology by way of an assignment. The assignment was recorded in the U.S. Patent and Trademark Office (USPTO) on November 14, 200 at reel/frame 011288/0202.

III. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to the appellants, appellants' representatives or assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

IV. STATUS OF THE CLAIMS

Claims 1-16 are pending in the application. Claim 1 is an independent claim upon which claims 2-16 ultimately depend. Claims 1-16 were rejected under 35 U.S.C. §103. Claims 1, 2, 10, 11 and 12 were rejected under 35 U.S.C. §103 as being unpatentable over Azuma et al. (JP 9-115686-A) in view of Schmitt III et al. (U.S. Patent No. 5,356,672). Claims 1, 3-10, 15 and 16 were rejected under 35 U.S.C. §103 as being unpatentable over Selwyn (U.S. Patent No. 5,961,772) in view of Schmitt III et al. Claim 2 was rejected under 35 U.S.C. §103 as being unpatentable over Selwyn in view of Schmitt III et al. and Kawase et al. (U.S. Patent No. 5,734,143). Claims 11-14 were rejected under 35 U.S.C. § 103 as being unpatentable over Selwyn in view of Schmitt and Sakudo et al. (U.S. Patent No. 4,543,465). The claims on appeal, Claims 1-16, are set forth in the attached Appendix 1.

V. STATUS OF THE AMENDMENTS

The Amendment submitted on September 10, 2002 was entered amending claim 1. In response to this amendment, a final Office Action dated November 8, 2002 was issued finally rejecting claims 1-16 under 35 U.S.C. §103. A Notice of Appeal was filed on May 8, 2003.

VI. SUMMARY OF THE INVENTION

A. Related Art Problems Overcome by the Invention

For successful implementation of plasma etching and deposition, it is important to generate high-energy and therefore highly reactive, neutral particles, in particular, radicals, with a sufficiently high efficiency. The technical solution to this problem is being increasingly linked with the simultaneous need to satisfy additional requirements for prevention of the influence of electric fields and charged particles on the process substrate, and for the broadest possible operating range for etching and deposition processes. For a smooth operation of a device to meet these needs complicated tuning unit and additional water loads are needed to absorb non-tuned, reflected and non-converted energy.

B. Object of the invention

The invention of the present application provides a solution, that essentially needs no tuning, since no resonance conditions have to be observed and no standing wave with a voltage maximum at a particular site need be available for generation of the plasma. The plasma zone is located at one site of the coaxial conductor at which normally the dielectric is found on a coaxial conductor. The plasma in the plasma zone thus represents a "high-loss dielectric." The energy of the electromagnetic wave is thus converted directly at a high efficiency into a high-density plasma. Due to the ohmic load, the electromagnetic wave experiences a high attenuation, so that tuning of the device is superfluous. In other words, the plasma discharge occurring in the plasma zone damps the system and makes it broad band.

Thus in the invented device the complicated tuning units and also an additional water load can be omitted. The invented device thus makes possible a very small and compact design

which can be easily integrated into existing production or laboratory installations. In addition, the coaxial conductor features a displaceable inner conductor and an outer conductor. Since the impedance of a coaxial conductor is defined by the outer diameter of the inner conductor, the inner diameter of the outer conductor and the dielectric constant of the medium between inner and outer conductor, the adjustment of the device is especially easy.

C. The claimed invention

1. Independent claim 1

Independent claim 1 is a device to generate excited and/or ionized particles in a plasma from a process gas with a generator (FIG. 1, reference number 11) to generate an electromagnetic wave, an electric coaxial conductor (FIG. 1, reference number 30) in which the electromagnetic wave is guided, and at least one plasma zone (FIG. 1, reference number 20) in which the excited and/or ionized particles are formed by the electromagnetic wave. The device includes an inlet (FIG. 1, reference number 17) that is available for inlet of the process gas into an interior chamber (FIG. 1, reference number 31) of the coaxial conductor (FIG. 1, reference number 30) between an outer conductor (FIG. 1, reference number 18) and a displaceable inner conductor (FIG. 1, reference number 19 and page 7, first full paragraph of the specification of the present application), and that the inner chamber forms the plasma zone (FIG. 1, reference number 20).

2. Dependent claims 2-16

Dependent claim 2 is dependent on claim 1 and defines the generator (FIG. 1, reference number 11) as a magnetron to generate an electromagnetic wave.

Dependent claim 3 is dependent on claim 1 and defines the inner conductor (FIG. 1, reference number 19) of the coaxial conductor (FIG. 1, reference number 30) as being manufactured from metal, from metal coated with oxide or quartz or from metallized oxide or quartz.

Dependent claim 4 is dependent on claim 1 and defines the outer conductor (FIG. 1, reference number 18) of the coaxial conductor (FIG. 1, reference number 30) as being manufactured from metal, metal coated with oxide or quartz, or from metallized oxide or quartz.

Dependent claim 5 is dependent on claim 1 and defines the inner conductor (FIG. 1, reference number 19) and/or the outer conductor (FIG. 1, reference number 18) of the coaxial conductor (FIG. 1, reference number 30) as being cooled by means of cooling.

Dependent claim 6 is dependent on claim 1 and defines the electromagnetic wave as being guided by means of an impedance converter (FIG. 1, reference numbers 12 and 15) into the coaxial conductor (FIG. 1, reference number 30).

Dependent claim 7 is dependent on claim 6 and defines the impedance converter as including a hollow waveguide (FIG. 1, reference number 12) and an impedance transformer cone (FIG. 1, reference number 15).

Dependent claim 8 is dependent on claim 6 and defines a transport region (FIG. 1, reference number 50) in which the electromagnetic wave is transported essentially without loss as being located between the generator (FIG. 1, reference number 11) for the electromagnetic wave or the impedance converter (FIG. 1, reference numbers 12 and 15) and the plasma zone (Fig. 1, reference number 20).

Dependent claim 9 is dependent on claim 8 and defines the transport region (FIG. 1, reference number 50) as being formed as a coaxial conductor.

Dependent claim 10 is dependent on claim 1 and defines the length of the plasma zone (FIG. 1, reference number 20) as being variable.

Dependent claim 11 is dependent on claim 1 and defines a magnetic system (FIG. 1, reference number 40) is provided.

Dependent claim 12 is dependent on claim 11 and defines the magnetic system (FIG. 1, reference number 40) includes at least one magnetic field coil (FIG. 1, reference number 42) on the outside of the outer conductor (FIG. 1, reference number 18).

Dependent claim 13 is dependent on claim 11 and defines the magnetic system (FIG. 1, reference number 40) as including magnetic rings (FIG. 1, reference number 43) and/or pole shoe rings at the outside of the outer conductor (FIG. 1, reference number 18).

Dependent claim 14 is dependent on Claim 11 and defines the magnetic system (FIG. 1, reference number 40) as including rod pole shoes or rod magnets (FIG. 1, reference number 44) in the inner conductor (FIG. 1, reference number 19).

Dependent claim 15 is dependent on Claim 1 and defines a sensor system provided to monitor the plasma (FIG. 1, reference number 25) in the plasma zone (FIG. 1, reference number 20).

Dependent claim 16 is dependent on claim 1 and defines the inner conductor (FIG. 1, reference number 19) and/or the outer conductor (FIG. 1, reference number 18) of the coaxial conductor (Fig. 1, reference number 30) as being cooled by water cooling.

VII. ISSUES

A. Whether Claims 1, 2, 10, 11 and 12 are unpatentable over Azuma et al (JP 9-115686-A) in view of Schmitt III et al (U.S. Patent No. 5,356,672) under 35 U.S.C. §103(a).

B. Whether Claims 1, 3-10, 15 and 16 are unpatentable over Selwyn (U.S. Patent No. 5,961,772) in view of Schmitt III et al (U.S. Patent No. 5,356,672) under 35 U.S.C. §103(a).

C. Whether Claim 2 is unpatentable over Selwyn (U.S. Patent No. 5,961,772) in view of Schmitt III et al (U.S. Patent No. 5,356,672) as applied to claims 1, 3-10, 15 and 16 above, and further in view of Kawase et al (U.S. Patent No. 5,734,143) under 35 U.S.C. §103(a).

D. Whether Claims 11-14 are unpatentable over Selwyn (U.S. Patent No. 5,961,772) in view of Schmitt III et al (U.S. Patent No. 5,356,672) as applied to claims 1, 3-10, 15 and 16 above, and further in view of Sakudo et al (U.S. Patent No. 4,543,465) under 35 U.S.C. §103(a).

VIII. GROUPING OF CLAIMS

Each claim of this patent application is separately patentable, and upon issuance of a patent, will be entitled to a separate presumption of validity under 35 U.S.C. §282.

IX. APPELLANTS ARGUMENTS

A. Rejection of claims 1, 2, 10, 11 and 12 under 35 U.S.C. §103(a) as being unpatentable over Azuma et al. (JP 9-115686-A) in view of Schmitt III et al. (U.S. Patent No. 5,356,672)

Claims 1, 2, 10, 11 and 12 were rejected under 35 U.S.C. §103 as being unpatentable over Azuma et al. in view of Schmitt III et al. The following is stated in the outstanding Office Action:

Azuma et al teach a microwave plasma apparatus (Fig. 1) comprising: a microwave plasma source 10 (a generator to generate an electromagnetic wave); an inner electrode 1 and an external electrode 2 (a coaxial conductor in which the electromagnetic wave is guided); and annular region defined between the inner and the external electrodes in which plasma 7 is formed (at least one plasma zone in which the excited and/or ionized

particles are formed by the electromagnetic wave) wherein the plasma gas is introduced into the annular region (an interior chamber of the coaxial conductor between an outer conductor and an inner conductor and that the inner chamber forms the plasma zone) via a valve 6 connected to a gas source 18 (abstract and paragraph 0013-0016).

Azuma et al fail to teach the inner electrode being displaceable (adjustable).

Schmitt III et al teach a plasma tube (Fig. 1) wherein an inner tube 30 is adjustable for controlling the location of a plasma 52 within an outer tube 19 (column 4, lines 11-42 and column 5, line 66 through column 6, line 6).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the adjustable mechanism as taught by Schmitt II et al in the apparatus of Azuma et al in order to control the location of plasma within the outer tube (external electrode).

Reconsideration and withdrawal of the rejection of claims 1, 2, 10, 11 and 12 under 35 U.S.C. §103 as being unpatentable over Azuma et al. in view of Schmitt III et al. are respectfully requested.

In order to determine obviousness or non-obviousness of patent application claims under 35 U.S.C. § 103, several basic factual inquiries must be made. These factual inquiries are set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. 459, 467 (1996):

Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or non-obviousness of the subject matter is determined.

In rejecting claims under 35 U.S.C. §103, and Examiner bears an initial burden of presenting a prima facie case of obviousness. A prima facie case of obviousness is established only if the teachings of the prior art would have suggested the claimed subject matter to a person of ordinary skill in the art. If an Examiner fails to establish a prima facie case, the rejection is improper and will be overturned. See *In re Rijckaert*, 9 F.3d 1531, 28 U.S.P.Q. 2d 1955 (Fed. Cir. 1993). "If examination ... does not produce a prima facie case of unpatentability, then without more the applicant is entitled to the grant of the patent." *In re Oetiker*, 977 f.2d 1443, 1445-1446, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

A prima facie case of obviousness has not been made in that the combination of Azuma et al. and Schmitt III et al. fails to teach or suggest the invention as recited in claim 1 of the present application. It is further submitted that a proper motivation is not provided in the Office Action to combine Azuma et al. with Schmitt III et al. to teach or suggest the invention as recited in claim 1 of the present application.

The invention as set forth in claim 1 includes an interior chamber of a coaxial conductor between an outer conductor and a displaceable inner conductor. As explained on page 7, first complete paragraph of the present application, this feature allows for easy adjustment of the device without affecting the impedance.

Azuma et al. discloses a plasma production accelerator comprising inner and outer electrodes 1,2 which are coaxial to each other. A microwave introducing means is also provided comprising wave guides 12,16,17, a circulator 11, a damper 14 and pulse microwave source 10, so that a magnetic surface of CT plasma 7 is strengthened by introducing microwaves.

Schmitt III et al. discloses a supersonic gas jet detonation apparatus having a larger outer cylindrical nozzle 19 and an adjustable inner nozzle 30.

The combination of Azuma et al. and Schmitt III et al. fails to teach or suggest the feature of "an outer conductor (18) and a **displaceable** inner conductor (19)" as recited in claim 1 of the present application (emphasis added). It is argued in the outstanding Office Action that the combination of Azuma et al. and Schmitt III et al. discloses this feature of the claimed invention. Azuma et al. at best discloses an accelerator comprising inner and outer electrodes 1,2. Schmitt III et al. at best discloses an adjustable small cylindrical nozzle 30. It is argued in the outstanding Office Action that it would have been obvious to one of ordinary skill in the art at

the time of the invention to implement the adjustable mechanism as taught by Schmitt III et al. in the apparatus of Azuma et al. in order to control the location of plasma within the outer tube.

However, there is no motivation or suggestion provided in the Office Action to combine Azuma et al. with Schmitt III et al. Azuma et al. is drawn to the use of inner and outer electrodes 1,2 in a plasma production accelerator, and Schmitt III et al. is drawn to the use of inner and outer nozzles in a supersonic gas jet detonation apparatus. It is argued in the outstanding Office Action that it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the adjustable mechanism as taught by Schmitt III et al in the apparatus of Azuma et al in order to control the location of plasma within the outer tube.

However, there is no discussion as to why one of ordinary skill in the art would want to control the location of the plasma. Only the specification of the present application recognizes that the feature of "an outer conductor (18) and a **displaceable** inner conductor (19)" as recited in claim 1 of the present application (emphasis added) allows for easy adjustment of the device without affecting the impedance (see page 7, first complete paragraph of the present application).

Thus, it is respectfully submitted that there is no motivation to combine Azuma et al. with Schmitt III et al. and therefore the combination of Azuma et al. and Schmitt III et al. fails to teach or suggest the feature of "an outer conductor (18) and a **displaceable** inner conductor (19)" as recited in claim 1 of the present application (emphasis added). As discussed repeatedly throughout the specification of the present application, since the conductors are coaxial the impedance of the conductors does not change and therefore the inner conductor (19) can be displaceable thereby allowing for easy adjustment and avoiding the need to tune the device (see page 4, last paragraph of the present application).

B. Rejection of claims 1, 3-10, 15 and 16 under 35 U.S.C. §103(a) as being unpatentable over Selwyn (U.S. Patent No. 5,961,772) in view of Schmitt III et al. (U.S. Patent No. 5,356,672)

Claims 1, 3-10, 15 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Selwyn in view of Schmitt III et al. The following is stated in the outstanding Office Action:

Selwyn teaches an atmospheric plasma jet apparatus (Fig. 1) comprising: a capacitively coupled RF source 12 (a generator to generate an electromagnetic wave); a central rod-shaped electrode 14 and a cylindrical electrically conducting chamber 20 (a coaxial conductor in which the electromagnetic wave is guided); an annular region 18 through which plasma gases are passes (at least one plasma zone in which the excited and/or ionized particles are formed by the electromagnetic wave) wherein the plasma gases are introduced into the annular region 18 (an interior chamber of the coaxial conductor between an outer conductor and an inner conductor and that the inner chamber forms the plasma zone) via an inlet connected to a gas source 16 (column 5, lines 10-31 and column 7, lines 43-61).

Selwyn fails to teach the inner electrode being displaceable (adjustable).

Schmitt III et al teach a plasma tube (Fig. 1) wherein an inner tube 30 is adjustable for controlling the location of a plasma 52 within an outer tube 19 (column 4, lines 11-42 and column 5, line 66 through column 6, line 6).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the adjustable mechanism as taught by Schmitt II et al in the apparatus of Selwyn in order to control the location of plasma within the outer tube (external electrode).

Regarding claims 3 and 4 (the material composition of the electrically conductive chamber and the central electrode (coaxial conductor): The selection of material composition among the commonly used electrically conductor as metal is considered to have been obvious to one the ordinary skill in the art at the time of the invention and thus it does not add any new structural element to the apparatus.

Reconsideration and withdrawal of the rejection of claims 1, 3-10, 15 and 16 under 35 U.S.C. §103(a) as being unpatentable over Selwyn in view of Schmitt III et al. are respectfully requested.

In order to determine obviousness or non-obviousness of patent application claims under 35 U.S.C. § 103, several basic factual inquiries must be made. These factual inquiries are set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. 459, 467 (1996):

Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or non-obviousness of the subject matter is determined.

In rejecting claims under 35 U.S.C. §103, and Examiner bears an initial burden of presenting a prima facie case of obviousness. A prima facie case of obviousness is established only if the teachings of the prior art would have suggested the claimed subject matter to a person of ordinary skill in the art. If an Examiner fails to establish a prima facie case, the rejection is improper and will be overturned. See *In re Rijckaert*, 9 F.3d 1531, 28 U.S.P.Q. 2d 1955 (Fed. Cir. 1993). "If examination ... does not produce a prima facie case of unpatentability, then without more the applicant is entitled to the grant of the patent." *In re Oetiker*, 977 f.2d 1443, 1445-1446, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

A prima facie case of obviousness has not been made in that the combination of Selwyn and Schmitt III et al. fails to teach or suggest the invention as recited in claim 1 of the present application. It is further submitted that there is no motivation provided in the Office Action to combine Selwyn with Schmitt III et al. to teach or suggest the invention as recited in claim 1 of the present application.

The invention as set forth in claim 1 includes an interior chamber of a coaxial conductor between an outer conductor and a displaceable inner conductor. As explained on page 7, first complete paragraph of the present application, this feature allows for easy adjustment of the device without affecting the impedance.

Selwyn discloses an atmospheric pressure plasma jet. The plasma jet has a rod shaped electrode 14, which is located centrally in a conducting chamber 20. Gases are introduced into the annular region 18 of conducting chamber 20 through an inlet connected to gas source 16.

Schmitt III et al. discloses a supersonic gas jet detonation apparatus having a larger outer cylindrical nozzle 19 and an adjustable inner nozzle 30.

The combination of Selwyn and Schmitt III et al. fails to teach or suggest the feature of "an outer conductor (18) and a **displaceable** inner conductor (19)" as recited in claim 1 of the present application (emphasis added). It is argued in the outstanding Office Action that the combination of Selwyn et al. and Schmitt III et al. discloses this feature of the claimed invention. Selwyn at best discloses an atmospheric pressure plasma jet having a rod shaped electrode 14, which is centrally located in a conducting chamber 20. Schmitt III et al. at best discloses an adjustable small cylindrical nozzle 30. It is argued in the outstanding Office Action that it would be obvious to one of ordinary skill in the art at the time of the invention to implement the adjustable mechanism as taught by Schmitt III et al. in the apparatus of Selwyn in order to control the location of plasma within the outer tube (external electrode).

However, there is no motivation or suggestion provided in the Office Action to combine Selwyn with Schmitt III et al. Selwyn discloses an atmospheric pressure plasma jet having a rod shaped electrode 14, which is centrally located in a conducting chamber 20, and Schmitt III et al. is drawn to the use of inner and outer nozzles in a supersonic gas jet detonation apparatus. It is argued in the outstanding Office Action that it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the adjustable mechanism as taught by Schmitt III et al. in the apparatus of Selwyn in order to control the location of plasma within the outer tube (external electrode).

However, there is no discussion as to why one of ordinary skill in the art would want to control the location of the plasma. Only the specification of the present application recognizes that the feature of "an outer conductor (18) and a **displaceable** inner conductor (19)" as recited

in claim 1 of the present application (emphasis added) allows for easy adjustment of the the device without affecting the impedance (see page 7, first complete paragraph of the present application).

Thus, it is respectfully submitted that there is no motivation to combine Selwyn with Schmitt III et al. and therefore the combination of Selwyn and Schmitt III et al. fails to teach or suggest the feature of "an outer conductor (18) and a **displaceable** inner conductor (19)" as recited in claim 1 of the present application (emphasis added). As discussed repeatedly throughout the specification of the present application, since the conductors are coaxial the impedance of the conductors does not change and therefore the inner conductor (19) can be displaceable thereby allowing for easy adjustment and avoiding the need to tune the device (see page 4, last paragraph of the present application).

C. **Rejection of claim 2 under 35 U.S.C. §103(a) as being unpatentable over Selwyn (U.S. Patent No. 5,961,772) in view of Schmitt III et al (U.S. Patent No. 5,356,672) as applied to claims 1, 3-10, 15 and 16, and further in view of Kawase et al (U.S. Patent No. 5,734,143)**

Claim 2 was rejected under 35 U.S.C. §103(a) as being unpatentable over Selwyn in view of Schmitt III et al. as applied to claims 1, 3-10, 15 and 16, and further in view of Kawase et al.

The following is stated in the outstanding Office Action:

Selwyn in view of Schmitt III et al teach the limitations of the claim as discussed above except for the generator being a magnetron to generate an electromagnetic wave. Kawase et al teach a microwave plasma torch (Fig. 1) wherein a coaxial waveguide 5 including an outer conductor 5a and an inner conductor 5b are coupled to a microwave generator via a waveguide 2 (column 4, line 58 through column 5, line 38).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the microwave generator and the waveguide 2 as taught by Kawase et al in the apparatus of Selwyn in view of Schmitt III et al in order to generate an electromagnetic

wave in the apparatus of Selwyn in view of Schmitt III et al in order to generate an electromagnetic wave in the annular plasma region 18 as an art recognized equivalent for the same purpose.

Reconsideration and withdrawal of the rejection of claim 2 as being unpatentable over

Selwyn in view of Schmitt III et al. as applied to claims 1, 3-10, 15 and 16, and further in view of Kawase et al. are respectfully requested.

In order to determine obviousness or non-obviousness of patent application claims under 35 U.S.C. § 103, several basic factual inquiries must be made. These factual inquiries are set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. 459, 467 (1996):

Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or non-obviousness of the subject matter is determined.

In rejecting claims under 35 U.S.C. §103, and Examiner bears an initial burden of presenting a *prima facie* case of obviousness. A *prima facie* case of obviousness is established only if the teachings of the prior art would have suggested the claimed subject matter to a person of ordinary skill in the art. If an Examiner fails to establish a *prima facie* case, the rejection is improper and will be overturned. See *In re Rijckaert*, 9 F.3d 1531, 28 U.S.P.Q. 2d 1955 (Fed. Cir. 1993). "If examination ... does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to the grant of the patent." *In re Oetiker*, 977 f.2d 1443, 1445-1446, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

It is respectfully submitted that a *prima facie* case of obviousness has not been made for at least the reasons discussed in response to the rejection under 35 U.S.C. §103 of claims 1, 3-10, 15 and 16 as being unpatentable over Selwyn in view of Schmitt III et al. Claim 2 dependent on independent claim 1, and therefore includes the features recited in claim 1. Kawase et al. fails to cure the deficiencies argued in response to the rejection of independent claim 1, and therefore it

is respectfully submitted that claim 2 is patentable for at least the same reasons argued in response to the rejection of independent claim 1.

It is further submitted that dependent claim 2 recites additional features upon the subject matter of independent claim 1. These additional features render the claimed configuration of elements to be even more limited than the subject matter of the independent claims, thereby rendering each of these claims separately patentable such that they stand and fall alone, and do not stand and fall with the independent claims.

D. Rejection of claims 11-14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Selwyn (U.S. Patent No. 5,961,772) in view of Schmitt III et al (U.S. Patent No. 5,356,672) as applied to claims 1, 3-10, 15 and 16 above, and further in view of Sakudo et al (U.S. Patent No. 4,543,465)

Claims 11-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Selwyn in view of Schmitt III et al. as applied to claims 1, 3-10, 15 and 16 above, and further in view of Sakudo et al. The following is stated in the outstanding Office Action:

Selwyn in view of Schmitt III et al teach all the limitations of the claims except for a magnetic system provided outside of the outer conductor.

Sakudo et al teach a high-frequency discharge apparatus (Fig. 1) including a magnetic field generating system including a magnetic field generating coil 7 and a constant current source 11 in order to generate a magnetic field in a discharge space 6, the magnetic field will affect the plasma density characteristic particularly for ion extraction (column 2, lines 23-49 and claim 1).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to employ the magnetic field generating system as taught by Sakudo et al in the apparatus of Selwyn in view of Schmitt III et al in order to generate a magnetic field in the plasma region which will affect the plasma density characteristic particularly for ion extraction.

Regarding claims 13-14 (variation of magnetic generating system): the further addition of magnetic rings and rod at the outer and inner conductors are also considered obvious modification and within the general knowledge of one of ordinary skill in the art at the time of the invention.

Reconsideration and withdrawal of the rejection of claims 11-14 as being unpatentable over Selwyn in view of Schmitt III et al. as applied to claims 1, 3-10, 15 and 16 above, and further in view of Sakudo et al. are respectfully requested.

In order to determine obviousness or non-obviousness of patent application claims under 35 U.S.C. § 103, several basic factual inquiries must be made. These factual inquiries are set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 17, 148 U.S.P.Q. 459, 467 (1996):

Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or non-obviousness of the subject matter is determined.

In rejecting claims under 35 U.S.C. §103, and Examiner bears an initial burden of presenting a *prima facie* case of obviousness. A *prima facie* case of obviousness is established only if the teachings of the prior art would have suggested the claimed subject matter to a person of ordinary skill in the art. If an Examiner fails to establish a *prima facie* case, the rejection is improper and will be overturned. See *In re Rijckaert*, 9 F.3d 1531, 28 U.S.P.Q. 2d 1955 (Fed. Cir. 1993). "If examination ... does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to the grant of the patent." *In re Oetiker*, 977 f.2d 1443, 1445-1446, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

It is respectfully submitted that a *prima facie* case of obviousness has not been made for at least the reasons discussed in response to the rejection under 35 U.S.C. §103 of claims 1, 3-10, 15 and 16 as being unpatentable over Selwyn in view of Schmitt III et al. Claims 11-14 are dependent on independent claim 1, and therefore includes the features recited in claim 1. Sakudo et al. fails to cure the deficiencies argued in response to the rejection of independent claim 1, and therefore it is respectfully submitted that claims 11-14 are patentable for at least the same reasons argued in response to the rejection of independent claim 1.

It is further submitted that dependent claims 11-14 recites additional features upon the subject matter of independent claim 1. These additional features render the claimed configuration of elements to be even more limited than the subject matter of the independent claims, thereby rendering each of these claims separately patentable such that they stand and fall alone, and do not stand and fall with the independent claims.

X. CONCLUSION

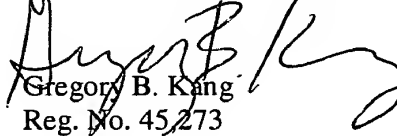
For all of the above-noted reasons, it is strongly contended that certain, clear and important distinctions exist between the present invention as recited in claims 1-16 and the cited references as provided in the Office Action. It is further contended that these distinctions are more than sufficient to render the claimed invention unobvious to a person of ordinary skill in the art at the time the invention was made.

This final rejection being in error, therefore, it is respectfully requested that this Honorable Board of Patent Appeals and Interferences reverse the Examiner's decision in this case, and indicate the allowability of claims 1-16.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fee deficiencies or credit any overpayments to Deposit Account No. 50-2036.

Respectfully submitted,

BAKER & HOSTETLER LLP


Gregory B. Kang
Reg. No. 45,273

Washington Square, Suite 1100
1050 Connecticut Avenue, N.W.
Washington, D.C. 20036
Phone: (202) 861-1500
Fax: (202) 861-1783
Date: August 8, 2003

APPENDIX 1

1. (Twice Amended) Device to generate excited and/or ionized particles in a plasma from a process gas with a generator (11) to generate an electromagnetic wave, an electric coaxial conductor (30) in which the electromagnetic wave is guided, and at least one plasma zone (20) in which the excited and/or ionized particles are formed by the electromagnetic wave, characterized in that an inlet (17) is available for inlet of the process gas into an interior chamber (31) of the coaxial conductor (30) between an outer conductor (18) and a displaceable inner conductor (19), and that the inner chamber forms the plasma zone (20).

2. Device according to Claim 1, characterized in that the generator (11) is a magnetron to generate an electromagnetic wave.

3. Device according to Claim 1, characterized in that the inner conductor (19) of the coaxial conductor (30) is manufactured from metal, from metal coated with oxide or quartz or from metallized oxide or quartz.

4. Device according to Claim 1, characterized in that the outer conductor (18) of the coaxial conductor (30) is manufactured from metal, metal coated with oxide or quartz, or from metallized oxide or quartz.

5. Device according to claim 1, characterized in that the inner conductor (19) and/or the outer conductor (18) of the coaxial conductor (30) are cooled by means of cooling.

6. Device according to Claim 1, characterized in that the electromagnetic wave is guided by means of an impedance converter (12, 15) into the coaxial conductor (30).

7. Device according to Claim 6, characterized in that the impedance converter (12, 15) is composed of a hollow waveguide (12) and impedance transformer cone (15).

8. Device according to Claim 6 characterized in that between the generator (11) for the electromagnetic wave or the impedance converter (12, 15) and the plasma zone (20), there is a transport region (50) in which the electromagnetic wave is transported essentially without loss.

9. Device according to Claim 8, characterized in that the transport region (50) is formed as a coaxial conductor.

10. Device according to Claim 1, characterized in that the length of the plasma zone (20) is variable.

11. Device according to Claim 1, characterized in that a magnetic system (40) is provided.

12. Device according to Claim 11, characterized in that the magnetic system (40) is composed of at least one magnetic field coil (42) on the outside of the outer conductor (18).

13. Device according to Claim 11, characterized in that the magnetic system (40) consists of magnetic rings (43) and/or pole shoe rings at the outside of the outer conductor (18).

14. Device according to Claim 11, characterized in that the magnetic system (40) is composed of rod pole shoes or rod magnets (44) in the inner conductor (19).

15. Device according to Claim 1, characterized in that a sensor system is provided to monitor the plasma (25) in the plasma zone (20).

16. Device according to claim 1, characterized in that the inner conductor (19) and/or the outer conductor (18) of the coaxial conductor (30) are cooled by water cooling.